



## Centre for IT-Intelligent Energy Systems for Cities

Heller, Alfred

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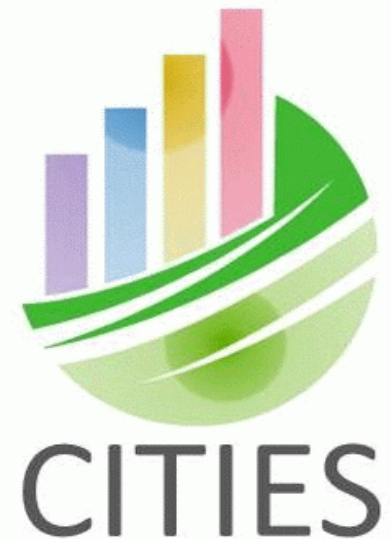
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# Centre for IT-Intelligent Energy Systems for Cities

Årsmøde CLEAN  
22. Maj 2015

(AI)Fred Heller  
Vice Centerleder CITIES  
Lektor DTU Byg  
[alfh@byg.dtu.dk](mailto:alfh@byg.dtu.dk)



# Smart Cities – Hvorfor det?

- Byer's infrastrukturer, IT, organisation bliver mere og mere kompleks.
- Der søges efter en rationale til samling.
- *Smart Cities er rationalet til at samle "alt" i byen  
– organisatorisk som teknisk  
... hvor Big Data er et værktøj af mange*
- Det giver en unikt mulighed for forretning og innovation.



(AI)fred Heller

# Smart Cities er seriøst forretning

## **CITIES**

- 71 mio
- 44 mio i tilskud DSF
- 40 partner
- 2014-2019 (2020!!!)
- Forskning
- 11 PhD
- 5 PostDocs

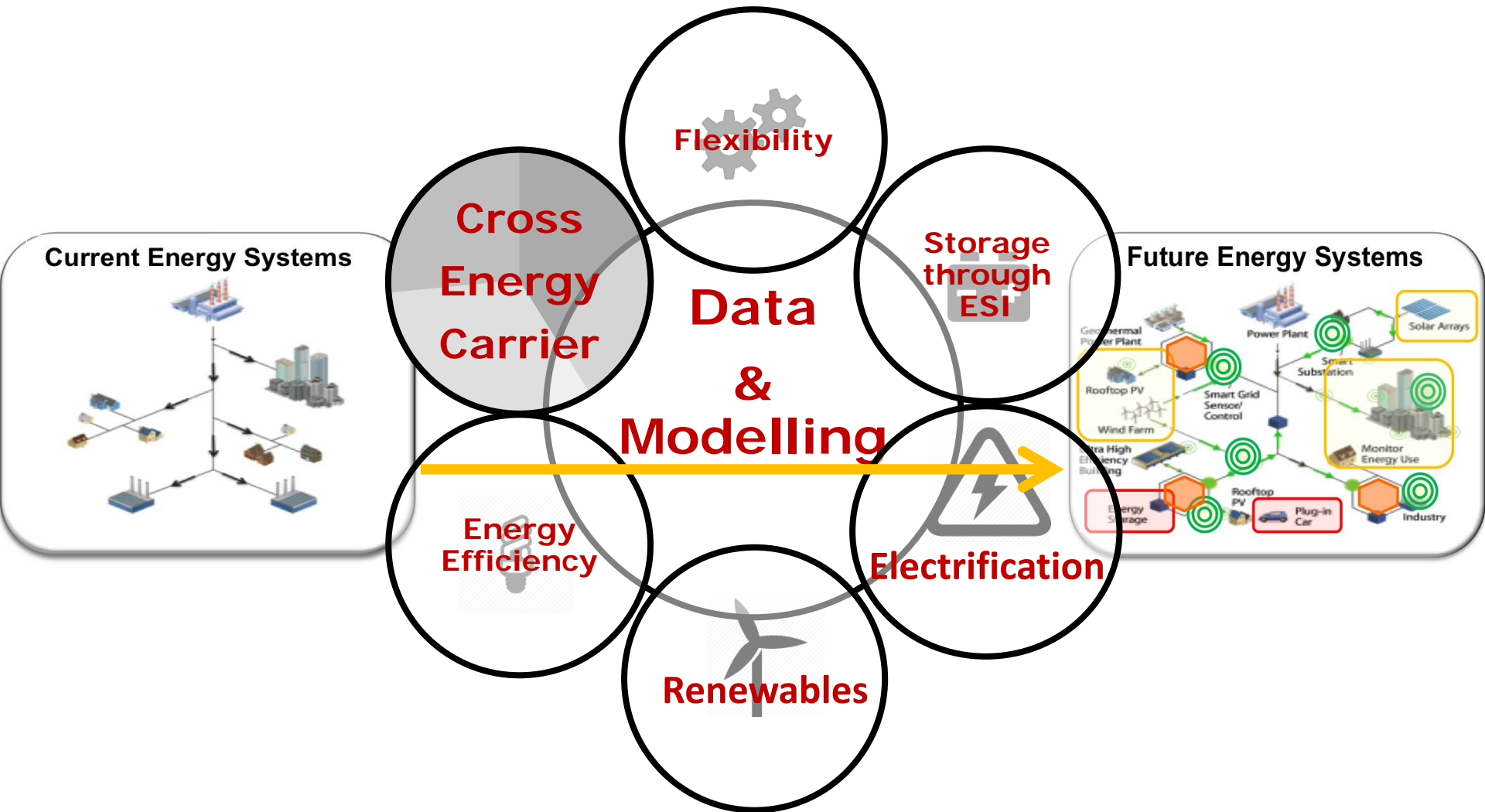
## **EnergyLab Nordhavn**

- 129 mio
- 79 mio i tilskud EUDP
- 8 partner
- 2014-2019
- Udvikling og demonstration
- 9 PhD
- 4 PostDocs

Projekterne vokser og bliver flere

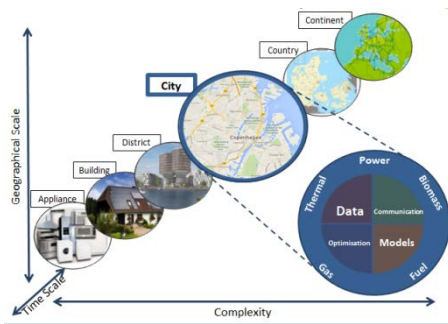
International: IEA, EERA, EU, partner fra Korea, USA, ... hele verden

# Den grundlæggende ide (bag CITIES)

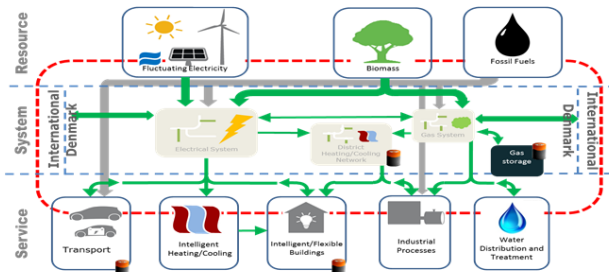


## Overgang i verdens energisystemer

## Dimensioner:



## System: (grundtanke)



Vi ønsker at bygge

ÉT MODEL

men

mere realistisk er

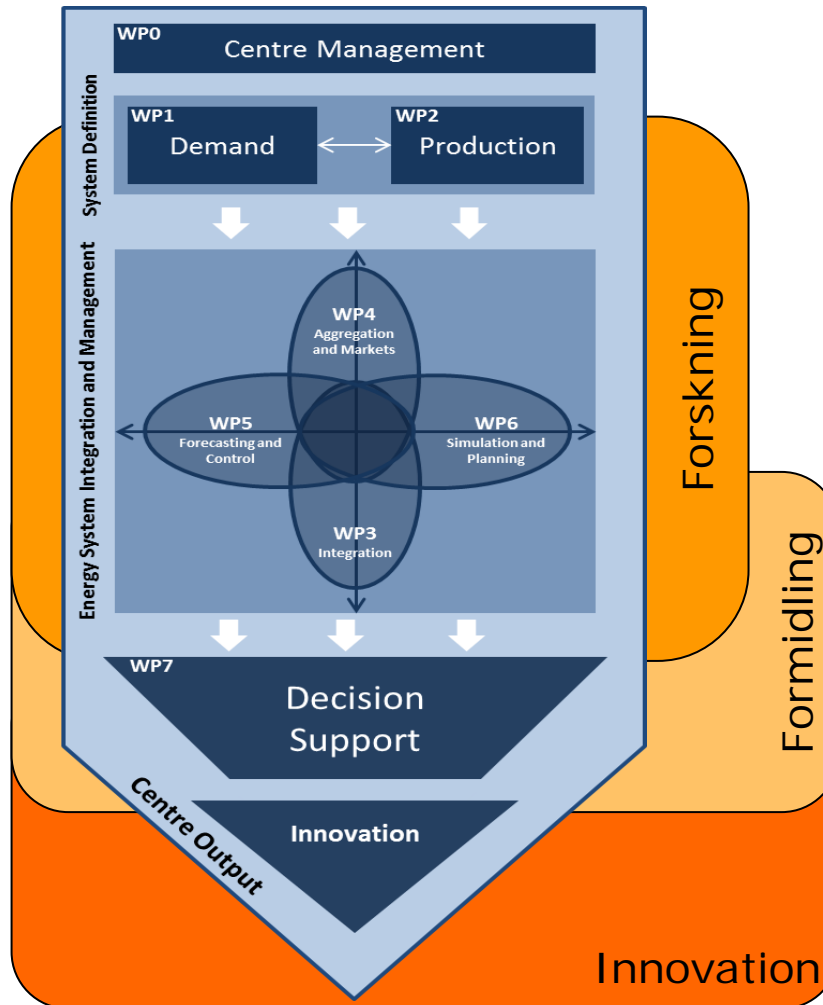
at bygge flere modeller der bygges sammen i

en simuleringsplatform

understøttet af data og en

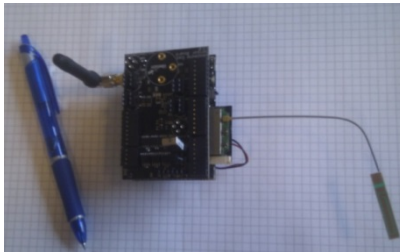
**dataplatform**

# Organisering



# Forskningsmetoden /r

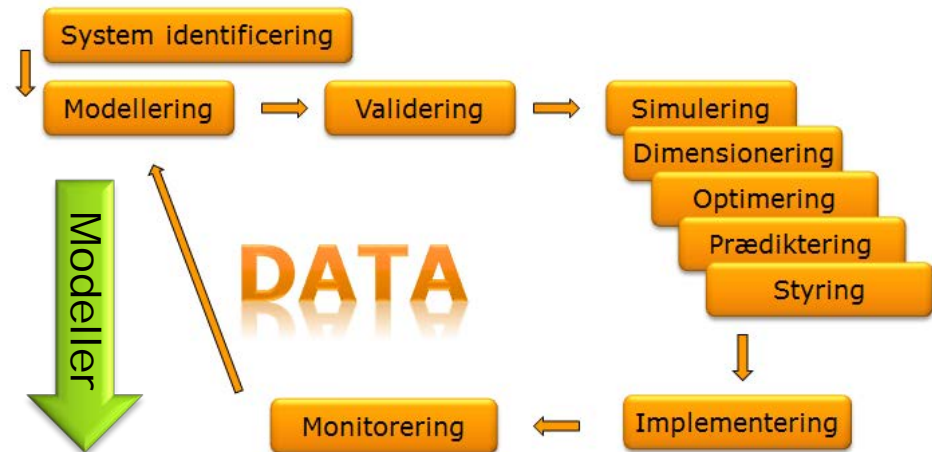
Måling (evidens):



Wasp mote Platform



Data som fælles råstof:





## Metode - Test Labs

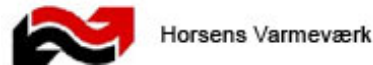
- ESIF (NREL, USA)
- Kubic (Tecnalia, Spain)
- DH facilities in S. Korea
- UCD Ireland
- PowerLab.dk (SYSLAB/Bornholm)
- Grundfos test buildings
- Danfoss test facility for supermarket cooling
- DTU's test houses



## Metode - Living Labs (Byer)

- Modelby: Svendborg
  - Odense
  - Vinge: Frederikssund
  - København
  - Århus
  - Horsens
- og flere associeres løbende...

Fjernvarme  Fyn

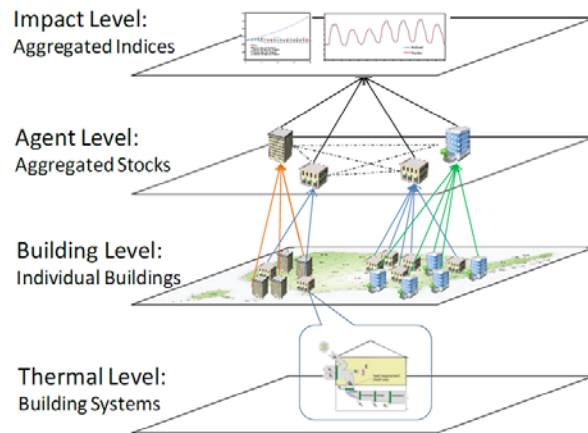


FREDERIKSSUND  
KOMMUNE

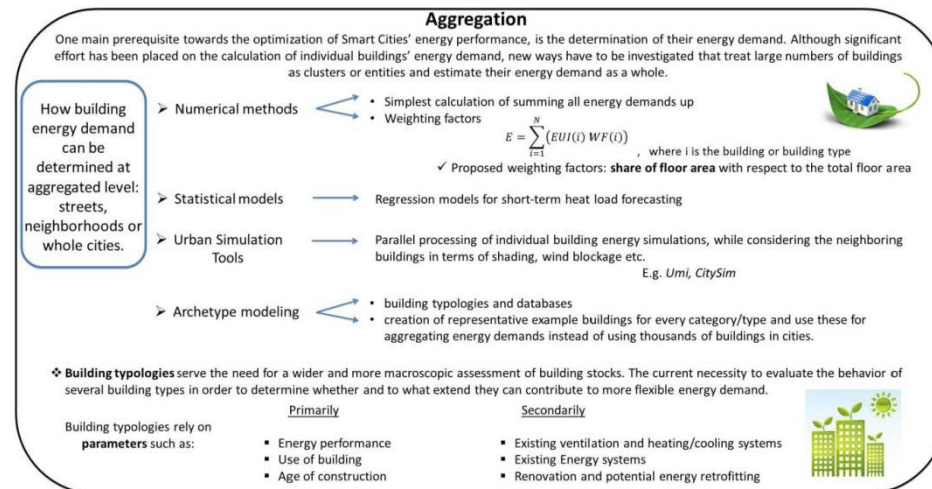
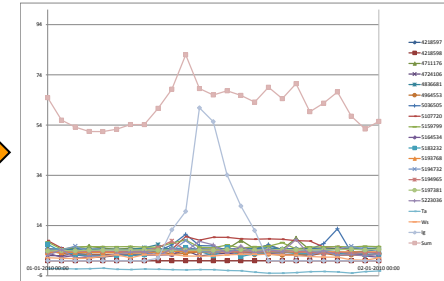
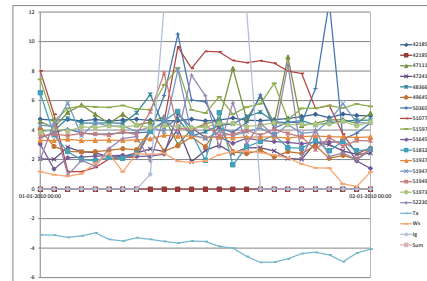


KØBENHAVNS KOMMUNE

## Modelby Svendborg



aggregering



Lille suk:

1 års arbejde for at etablere opsamling af data fra 140 bygninger

(el, fjernvarme, gas)

## Case – Dynamiske Fjernvarmepriser

Erfaringer opsamles

Dynamiske modeller opbygges og simuleringer bruges for at skabe scenarier

Kontrakter defineres og forsøges anvendt

## Case – Fleksibilitet i væksthuse

Væksthuse

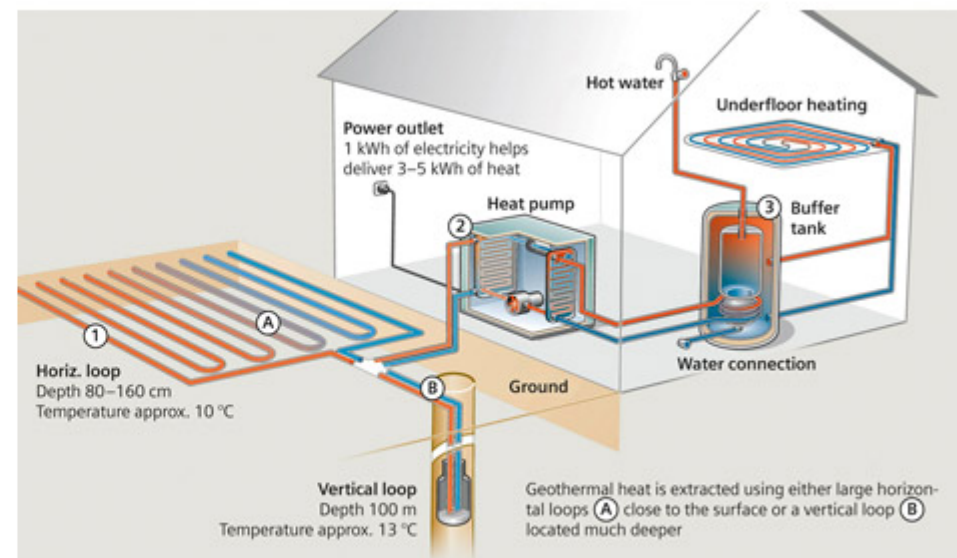
- særpræget hygrotermiske forhold
- mulighed for at køre temperaturen op og ned
- mulighed for ekstra termiske buffere



# Case – Styling af Heat Pumps

## Heat Pumps Extract Heat from the Ground

- 1) Ground warms cold water flowing through horizontal or vertical loops.
- 2) Heat pump extracts heat from the water and compresses the gas in order to make it hotter.
- 3) Heat is stored and is available for heating and hot water production.



Greybox modeller til prædiktering af varmebehov ud fra vejret og energipriser

Innovation: MPC stylinger for bygninger, fjernvarme og meget andet